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CIRCUIT TRAINING GAMES TO TRAIN BASIC MOVEMENT SKILLS OF GRADE IV ELEMENTARY SCHOOL STUDENTS

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Abstract
Lack of student participation in fundamental movement learning remains a challenge in elementary physical education, resulting in limited mastery of basic motor skills. This study aimed to develop a circuit training game model to improve students' locomotor, non-locomotor, and manipulative movement skills. The study employed a Design-Based Research (DBR) approach involving problem analysis, model development, iterative testing, and reflection. Data were collected through observations, interviews, and direct performance assessments and were analyzed using descriptive quantitative and qualitative techniques. Expert validation results showed that the circuit training model achieved a feasibility score of 91.67%, indicating that the model met the required validity and reliability standards. The effectiveness of the model was assessed using a four-point performance rubric (maximum score = 4). In the small-scale trial, the mean scores were 3.85 for locomotor skills, 3.50 for non-locomotor skills, and 3.42 for manipulative skills. In the large-scale trial, the mean scores increased to 3.89, 3.79, and 3.75, respectively. These findings indicate that the circuit training game model effectively supports the development of fundamental motor skills and promotes active participation in physical education learning. It can therefore serve as a practical and engaging instructional model for elementary school students.

INTRODUCTION

Education is a fundamental right that must be received by every individual to adapt to the rapid progress of the times. The 21st century requires students not only to master knowledge but also to maintain a healthy lifestyle, physical fitness, and social adaptability. Within this context, physical education, sports, and health emerge as integral components of the education system. These subjects play a crucial role in enhancing physical growth, psychological development, motor skills, emotional stability, and environmental awareness through physical activity. At the elementary school level, physical education is particularly significant because it lays the foundation

for children's growth and development. As children's primary stimulus is movement, the more frequently they engage in movement, the more effectively they learn and acquire essential knowledge and skills. Schmith in Supriady (2021) emphasizes that physical education serves as a medium to foster the development of motor and physical skills, knowledge, values (mental-emotional-spiritual-social), and healthy lifestyles. Similarly, Saitya & Yamin (2022) highlights that balanced growth and development are best stimulated through active participation in physical activities.

A core component of physical education is the mastery of basic movement skills or fundamental motor skills, which form the building blocks of more advanced physical activities. These skills describe the degree of mastery over coordination abilities, including hand-eye and foot-eye coordination, balance, tempo, and visual perception (Bakhtiar, 2014; Budiarjo et al., 2023). Without mastering these basic skills, children are likely to experience difficulties when learning more complex movements. The essential forms of movement such as walking, running, jumping, and throwing represent the foundation of locomotor development. Research by Saputra & Firdaus (2019) confirms that elementary school students demonstrate forms of basic movement, particularly locomotor movements, which must be developed systematically during primary education. Locomotor skills, as one of the main domains of fundamental movement, require consistent guidance, practice, and reinforcement so that children can perform them properly (Machmud et al., 2021).

Previous research has highlighted the necessity of developing these movement skills. Amirzan (2017), for instance, found that effective development of locomotor, non-locomotor, and manipulative movements is crucial for supporting children's overall movement competence. However, despite such recognition, real-world observations indicate persistent challenges in practice. Observations conducted at SD Negeri Wates 01, Ngaliyan District, Semarang City, on January 22, 2024, revealed that the implementation of basic movement learning was less effective. Student participation was limited, and many students displayed a lack of enthusiasm and enjoyment, leading to minimal engagement. Interviews with physical education teachers at the same school further indicated that the average mastery of basic movements among fourth-grade students was only around 70, suggesting a need for targeted interventions to enhance participation and skill mastery. This lack of participation reflects not only on physical education outcomes but also on broader developmental aspects, as physical engagement is closely tied to cognitive, social, and emotional growth in children.

One of the most pressing issues in this context is the low student participation in learning basic movements, which contributes to suboptimal outcomes in both locomotor and manipulative skills (Chen et al., 2015; Rahma Dewi et al., 2024). When learning activities fail to engage students, the process becomes monotonous, and children tend to be reluctant to move. Addressing this problem requires innovative instructional strategies that can simultaneously improve skill development and foster enjoyment in learning (Lanos et al., 2024).

In this regard, circuit training presents itself as a promising solution. The circuit training model integrates structured stations with varied game-based activities, encouraging active participation and continuous engagement. Paramitha & Sutapa (2019) argue that circuit-based learning is particularly effective in enhancing locomotor, non-locomotor, and manipulative abilities.

Similarly, prior studies support its benefits: Beauty et al. (2020) reported that circuit training increased both physical fitness and student motivation, Nugraha et al. (2018) demonstrated improvements in manipulative movement skills, and Ma'mun & Asroriyah (2022) observed significant progress in fundamental movement skills among elementary school students. In line with these findings, empirical data have shown a progressive increase in performance, where manipulative skill mastery rose from 42.80% in the initial observation to 78.12% in subsequent cycles (Beauty et al., 2020). These results suggest that circuit-based games not only enhance physical competence but also stimulate greater enthusiasm and engagement in learning.

Despite the growing body of research, a clear gap in the literature remains. Previous studies largely focused on the physical or technical dimensions of circuit training, such as its effectiveness in improving motor performance or fitness levels. However, relatively few have addressed the problem of student disengagement in basic movement learning and how a game-based circuit model can directly improve participation and motivation while simultaneously strengthening motor skills. This study aims to fill that gap by developing and testing a circuit training game model specifically designed for fourth-grade elementary students.

The purpose of this research is not only to design and validate a circuit training model but also to evaluate its effectiveness in improving student participation, motivation, and mastery of locomotor, non-locomotor, and manipulative movements. The expected outcomes include (1) higher levels of student involvement in physical education classes, (2) measurable improvements in basic movement competence, and (3) the provision of a practical instructional model that can be easily adopted by teachers in diverse elementary school contexts.

The significance of addressing basic movement skills extends beyond physical education. Students with well-developed fundamental motor skills are more likely to succeed in various physical activities, maintain better health, and develop higher self-confidence. Additionally, improvements in motor competence are associated with cognitive and social development, supporting children's overall learning process. In this way, the development of a circuit training model contributes to both the theoretical discourse on motor learning and the practical improvement of physical education pedagogy.

Therefore, this study positions itself within the broader theoretical framework of motor learning and student engagement. By drawing upon established theories of physical education and movement development, while simultaneously addressing the practical challenge of low student participation, this research provides both academic contributions and practical solutions for elementary education. Ultimately, the circuit training game model is expected to serve as an innovative instructional approach that not only improves fundamental movement skills but also enhances students' enjoyment, motivation, and long-term engagement in physical activity.

METHODS

The research method used is DBR (Design based research) in the field of education, which is a series of approaches aiming to produce new theories and practices that explain and potentially impact the natural teaching and learning process. (Suryani, 2016). The use of design based research promises to increase and contribute theoretically to the public value of educational technology research, in circuit development research, the research steps applied are as follows:

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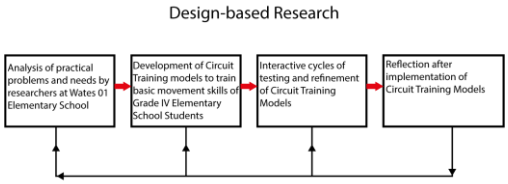

Fig 1 Research Steps

The first stage was the analysis of practical problems and needs, which aimed to identify the core issues in learning basic movements at the elementary level. Preliminary observations and interviews with teachers at Wates 01 Elementary School revealed that students demonstrated low participation in physical education classes, with many displaying a lack of motivation and enjoyment. In addition, teacher reports indicated that fourth-grade students had not yet achieved satisfactory mastery of fundamental motor skills, with an average score of only 70. These findings underscored the urgency of designing an instructional model that could simultaneously improve skill acquisition and increase student engagement.

The second stage was the design and development of the circuit training model. Drawing from motor learning theories and prior research in physical education, the researchers designed a game-based circuit model consisting of four activity stations. Each station targeted specific domains of fundamental motor skills: locomotor, non-locomotor, and manipulative. The design emphasized variation and playfulness to sustain student interest and prevent boredom while ensuring that the practice remained aligned with curricular goals. Expert review was sought at this stage to refine the model and confirm its pedagogical appropriateness for fourth-grade students.

The third stage was the iterative cycles of testing and refinement. This stage consisted of a small-scale trial involving 14 students and a large-scale trial involving 29 students. The small-scale trial served as a feasibility test, providing feedback on clarity of instructions, appropriateness of activities, and student responses. Based on the observations and teacher input, necessary adjustments were made to the model. The revised version was then tested in a larger group, where quantitative data on student performance and qualitative feedback from teachers were collected to assess the model's effectiveness more comprehensively. This iterative process ensured that the model was continuously improved in response to empirical evidence from classroom practice.

The fourth stage was the reflection after implementation, where the results of the development and trials were systematically analyzed to draw conclusions about the model's strengths, weaknesses, and overall feasibility. At this stage, both quantitative and qualitative data were considered together to ensure a balanced evaluation. The model achieved a reliability score of 91.67% from expert validation, confirming its validity and reliability for use in elementary physical education. Reflection also addressed the broader implications of implementing the model in similar educational contexts, providing guidance for future application and development.

This research was conducted at Wates 01 Elementary School, Ngaliyan District, Semarang City, between July and August 2024. The participants consisted of 28 fourth-grade students aged 9–10 years (15 boys and 13 girls). The school was chosen purposively based on the identified need for improving participation and skill mastery in physical education classes.

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Data collection employed three complementary techniques to ensure triangulation. Observations using structured rubrics were conducted to record student participation, enthusiasm, and skill performance during activities. Semi-structured interviews with physical education teachers were used to gain deeper insights into instructional challenges and to collect formative feedback for model refinement. Direct performance measurements were administered at the pre-test, small-scale trial, and large-scale trial stages to evaluate student mastery of locomotor, non-locomotor, and manipulative skills.

The data analysis process combined quantitative and qualitative approaches. Quantitative data from observations and performance tests were analyzed using descriptive statistics (mean, median, mode, and standard deviation) to track progress across trials. Validation by experts, which yielded a reliability score of 91.67%, provided further confirmation of the model's feasibility. Qualitative data from interviews and observational notes were analyzed thematically to identify recurring patterns, challenges, and suggestions for improvement, which were then integrated into the iterative refinement process (Mukaromah et al., 2024).

By following these four stages of DBR, the study was able to systematically develop, test, and refine a circuit training game model that directly addressed the problem of low student participation in basic movement learning. At the same time, this methodological approach ensured that the outcomes were theoretically grounded, empirically validated, and practically relevant for physical education teachers in elementary schools..

RESULTS AND DISCUSSION

1. *Analysis problem and needs*

Observation results show that implementing the basic movement learning process could have been more effective. Lack of student participation in implementing basic movement learning is one of the obstacles in the basic movement learning process. Lack of enjoyment in learning causes students to be too Classroom observations indicated that student engagement during basic movement learning activities was relatively low, as many students showed limited participation and enthusiasm during practice sessions. Interviews with physical education teachers further revealed that fourth-grade students had not yet achieved optimal mastery of fundamental movement skills, with an average achievement score of 70. Although this score met the minimum learning criteria, it suggested that there was still considerable room for improvement, particularly in ensuring consistent participation and proficiency across locomotor, non-locomotor, and manipulative movement domains.

a. Why is this version more powerful?

This can be seen from the need for more student participation in the implementation of learning. The lack of enjoyment and enthusiasm for learning causes students to be too lazy to move. The circuit game model that was developed is expected to make students move actively and more enthusiastically in learning, especially to encourage an increase in students' basic movement abilities.

b. Develompment of Circuit Training models

After analyzing the problem, the circuit training model was developed for this study. The researcher created a product design by creating 4 circuit training game posts that contained several basic movements that had been developed, namely: Post 1 Physical Games develop basic locomotor

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and non-locomotor movement skills, Post 2 Paper Circle Game develops basic motor skills, Post 3 Ball Relay Game develops basic locomotor, non-locomotor, and manipulative movement skills, Post 4 Spinning Ball Game develops basic locomotor and manipulative movement skills. The Circuit training model implementation guide is designed using Canva as follows:

Fig 2 Manual view

Fig 3 Circuit training models activities

After the circuit training model implementation guidebook was designed in accordance with the basic movement elements that will be measured in the implementation of learning, the elements developed include locomotor, non-locomotor, and manipulative movements.

TABLE 1. DIMENSIONS AND ELEMENTS OF BASIC MOVEMENT DEVELOPED

No.	Dimensions	Activity Form	Movement Elements
1.	Locomotor	Locomotor skills to move the body from one place to another and jump.	Walk, run and jump.
2.	Non Locomotor	Non-locomotor skills are performed on the spot.	Bending, stretching, and balance.
3.	Manipulatif	Manipulative skills are developed as the Middle Child masters objects and involves coordination with existing space and objects.	Throwing, catching, and rolling.

The results of the reliability test of the circuit training game model to develop basic motor skills of grade IV elementary school students who received each game were 91.67

TABLE 2. PERCENTAGE RESULTS OF EACH GAME

No.	Game Name	Percentage Results	Qualification
1.	Physical Games	91.67%	Very good

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2.	Paper Circle Game	91.67%	Very good
3.	Ball Relay Game	91.67%	Very good
4.	Spinning Ball Game	91.67%	Very good

The validation of the circuit training game model was conducted through expert judgment using a structured rubric that assessed three aspects, namely content validity, construct validity, and reliability. Content validity ensured that each game activity accurately represented the fundamental motor skills required in elementary school, including locomotor, non-locomotor, and manipulative movements. Construct validity evaluated the alignment of the model design with the theoretical framework of motor learning and the objectives of physical education. Reliability referred to the consistency of the model when implemented across different contexts and groups of students.

The results of the expert validation show that all four games included in the model obtained the same score of 91.67 percent, which is categorized as very good. This percentage indicates that experts consistently agreed on the feasibility and appropriateness of the circuit training model to be applied in elementary school settings. The uniformity of scores across Physical Games, Paper Circle Game, Ball Relay Game, and Spinning Ball Game also confirms that every component of the model was equally strong in terms of design and pedagogical value.

Based on these findings, it can be concluded that the circuit training game model fully meets the requirements of validity and reliability for educational implementation. This means that the model is not only theoretically valid but also practically feasible to be used by physical education teachers to improve the fundamental motor skills of elementary school students.

c. Interative cycles of testing

A small-scale trial was conducted after the circuit training game model had been validated and revised by experts. The trial involved 14 fourth-grade (A) students from SD Negeri Wates 01, Ngaliyan District, Semarang City, who were selected purposively to represent the characteristics of the target users of the model. In design-based research, a limited number of participants is commonly used during the initial testing phase to evaluate the feasibility, practicality, and clarity of the developed product before wider implementation. The purpose of this trial was therefore to examine whether the model could be implemented effectively and to gather feedback for further refinement. The activities were conducted during physical education lessons to observe students' participation and performance while using the circuit training model.

Fig 4 Conditioning in the application of the circuit training model

Fig 5 Circuit training models activities

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The results of a small trial of the circle game model for developing basic motor skills of grade IV elementary school students obtained the following results:

TABLE 3. SMALL SCALE TEST RESULTS

No.	Rated aspect			Amout	Score
	Loco-motor	Non Loco-motor	Mani-pulatif		
1.	4	4	3	11	91.6
2.	3	3	3	9	75
3.	4	3	3	10	83.3
4.	3	3	3	9	75
5.	4	3	3	10	83.3
6.	4	4	4	12	100
7.	4	4	3	11	91.6
8.	4	4	4	12	100
9.	4	4	3	11	91.6
10.	4	3	4	11	91.6
11.	4	3	3	10	83.3
12.	4	4	4	12	100
13.	4	4	4	12	100
14.	4	3	4	11	91.6

The results of small-scale trials show good skills in applying the circuit learning model.

TABLE 4 SMALL SCALE TRIAL

Statistics

		Locomotor	Non Locomotor	Manipulative
N	Valid	14	14	14
	Missing	0	0	0
Mean		3.86	3.50	3.43
Median		4.00	3.50	3.00
Mode		4	3a	3
Std. Deviation		.363	.519	.514
Minimum		3	3	3
Maximum		4	4	4
Sum		54	49	48

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In the calculation of the effectiveness test of the model through the results of statistical calculations of research data, it is known that the average value of the comparison of small-scale trials of locomotor values of 3.85, non-locomotor 3.5, and manipulative 3.42 empirically proves that the product results in the form of a circle game model are very effective.

The large-scale trial is the last before the circle game model can be used to develop basic motor skills in grade IV elementary school students. This large-scale trial was conducted with 29 SD Negeri Wates 01 grade IV (B) students, Ngaliyan District, Semarang City. The results of large-scale research on the circle game model for developing basic motor skills in grade IV elementary school students are as follows:

TABLE 5. LARGE SCALE TEST RESULTS

No.	Rated aspect			Amout	Score
	Loco-motor	Non Locomotor	Mani-pulatif		
1.	3	3	3	9	75
2.	4	4	4	12	100
3.	4	4	4	12	100
4.	4	4	3	11	91.6
5.	4	4	4	12	100
6.	4	4	4	12	100
7.	4	4	3	11	91.6
8.	4	4	4	12	100
9.	4	4	4	12	100
10.	4	4	4	12	100
11.	3	4	3	10	83.3
12.	4	4	4	12	100
13.	4	3	4	11	91.6
14.	4	4	3	11	91.6
15.	4	4	4	12	100
16.	4	4	4	12	100
17.	4	4	4	12	100
18.	4	4	4	12	100
19.	4	4	3	11	91.6
20.	4	4	4	12	100
21.	4	3	4	11	91.6
22.	4	4	4	12	100
23.	4	3	4	11	91.6
24.	4	3	4	11	91.6
25.	4	4	4	12	100
26.	4	4	3	11	91.6
27.	4	4	4	12	100
28.	4	3	4	11	91.6
29.	3	4	4	11	91.6

The results of the data analysis of the circuit training game model for the development of basic motor skills of elementary school students in grade IV using statistical calculations through SPSS with the results of a comparison of the average of small trials with the average of large trials conducted at SD Negeri Wates 01, Ngaiyan District, Semarang City with a total of 29 students. The statistical analysis results of large-scale trials can be seen in the following table..

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TABLE 6 LARGE SCALE TRIAL

Statistics

		Locomotor	Non Locomotor	Manipulative
N	Valid	29	29	29
	Missing	0	0	0
Mean		3.90	3.79	3.76
Median		4.00	4.00	4.00
Mode		4	4	4
Std. Deviation		.310	.412	.435
Minimum		3	3	3

The results of large-scale trials of locomotor scores of 3.89, non-locomotor 3.79, and manipulative 3.75 have empirically proven that the product results in the form of a circle game model are very effective. The results of the comparison of the average values of small trials and large trials of the circuit training game model for the development of basic motor skills of elementary school students in grade IV as follows:

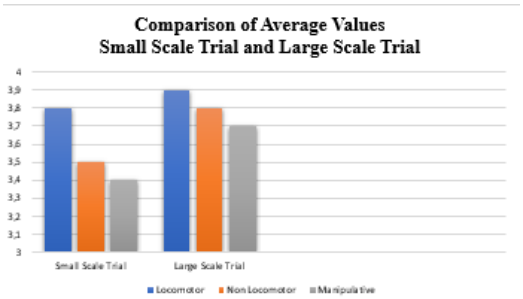

Fig 6 Comparison chart of average scores of small scale trials and large scale trials.

Based on the results of the diagram, it can be concluded that the effectiveness test of the Circuit Training Game Model product for the Development of Basic Motor Skills of Grade IV Elementary School Students is known that the effectiveness test of the model with an average value of the comparison of small-scale trials of locomotor values 3.85, non-locomotor 3.3, and manipulative 3.42. In contrast, the large-scale trial of locomotor 3.89, non-locomotor 3.79, and manipulative 3.75 has empirically proven the results of the product in the form of model 5 and manipulative 3.42. In contrast, the large-scale trial of locomotor values 3.89, non-locomotor 3.79, and manipulative 3.75 has empirically proven that the results of the product in the form of a circuit training game model have excellent effectiveness.

d. Reflection

The research results on developing physical activity models through circuit training games to develop basic motor skills of grade IV elementary school students produced four (4) circuit training games. The four (4) game stations contain basic movement elements, namely locomotor, non-locomotor, and manipulative, designed simply according to the characteristics of grade IV elementary school students. In developing this circuit game to develop students' basic movement abilities, namely as an effort to develop basic skills 4.1 Practicing a combination of basic locomotor movements according to the concept of body, space, effort, and connectedness in various forms of superficial and/or traditional games, 4.2 Practicing a combination of basic non-locomotor movements according to the concept of body, space, effort, and connectedness in various forms of superficial and/or traditional games, and 4.3 Practicing a combination of basic manipulative

movements according to the concept of body, space, effort, and connectedness in various forms of superficial and/or traditional games (Budiarjo, Bakhtiar, & Handayani, 2023; Setiadi & Widyastari, 2013; Wati & Jaenudin, 2020). In this circuit training game, which is packaged from item 1 to item 4 depending on the difficulty level, the game's form is varied in each item so that students stay energized while playing. In addition, this circuit training game is exciting and easy to use in physical education and health lessons because each item is a simple competition. This circuit game form goes through several stages of development, including initial product development, expert validation, reliability testing, small-scale trials, large-scale trials, effectiveness trials, and final products. The final result of this development is the final product that can be used in schools. This product has gone through a reliability test where the coefficient of each game is 91.67%, which is included in the high category. In learning activities, students experience changes. Students are more active and enjoy participating in learning, and this is marked by an increase in student learning outcomes, namely by achieving the minimum completeness criteria (KKM) by meeting all requirements completely. In the calculation of the effectiveness test of the model through the results of statistical calculations of research data, it is known that the average value of the comparison of small-scale trials of locomotor values is 3.85, non-locomotor 3.5, and manipulative 3.42.

In contrast, large-scale trials of locomotor values 3.89, non-locomotor 3.79, and manipulative 3.75 have been empirically proven that the results of the product in the form of a circle game model are very effective. This form of circuit training game consists of 4 game posts, the names of the circuit game models to develop basic motor skills of grade IV elementary school students, as follows: (1) Physical games, (2) Paper circle games, (3) Ball relay games (4) Spinning ball games, from this game can improve students' basic locomotor, non-locomotor and manipulative motor skills. This can be marked by completing student skills in every aspect of basic movement in each circle training game. Although this model has been compiled, it does not mean it is perfect. The use of the model developed for circuit training games must be adjusted to school conditions. Several improvements and adjustments need to be made so that the model created is more appropriate and valuable for physical education teachers and elementary school students.

2. Discussion

The findings of this study provide several important insights into students' learning styles and their perceptions of the classroom learning environment. First, the results show that kinesthetic learning style is the most dominant among students. This suggests that elementary school students tend to prefer learning through direct experience, physical activity, and active engagement. This finding may reflect students' preference for active and movement-based learning experiences, as previous studies have suggested that multimodal and interactive learning environments can enhance engagement and learning effectiveness (Firmansyah, 2021). Similarly, recent research on multimodal learning has shown that the integration of multiple sensory stimuli, such as visual, aural, verbal, and tactile elements, can improve cognitive performance, learning engagement, and students' sense of presence during classroom activities (Luo, 2023).

Such a tendency is consistent with the characteristics of young learners, who generally learn more effectively through hands-on activities rather than passive instruction. In terms of classroom perception, students generally reported positive responses, particularly in the aspects of individualization and naturalness. This indicates that elements such as classroom layout, flexibility, lighting, and overall physical conditions are considered supportive of the learning process. However, the stimulation aspect, which includes visual elements such as color and spatial complexity,

received a relatively lower score. This finding suggests that the visual and aesthetic quality of the classroom environment may not yet be fully optimized to enhance students' learning experiences.

Interestingly, the results of the Welch's ANOVA indicate that there is no significant difference in classroom perception across different learning style groups. This suggests that, although students may have different preferred ways of learning, their overall perceptions of the classroom environment do not significantly differ. One possible explanation is that the classroom environment provides a relatively uniform experience for all students, regardless of their individual learning preferences. These findings highlight that while learning styles are important in understanding how students engage with learning activities, the overall quality of the classroom environment plays a broader role that affects all students in a relatively consistent manner. Recent studies have questioned the effectiveness of strictly matching instruction with students' learning styles. A meta-analysis by Clinton-Lisell (2024) found limited empirical evidence supporting the learning styles hypothesis, suggesting that flexible instructional approaches may be more beneficial for diverse learners.

Therefore, instead of designing learning environments that cater exclusively to specific learning styles, it may be more effective to create flexible and inclusive classroom environments that can accommodate a range of learning preferences. This perspective aligns with previous studies on multimodal learning, which emphasize the importance of integrating diverse learning materials, digital media, physical environments, and interactive resources to support students' engagement and diverse learning needs in schools (Ekowati et al., 2024). It is further supported by Hutapea et al. (2026), who found that adaptive learning media based on Universal Design for Learning principles promote accessibility, active participation, and inclusive learning experiences through multimodal approaches.

Overall, this study emphasizes the importance of integrating both pedagogical and environmental considerations in designing effective learning spaces. By understanding students' learning characteristics and how they perceive their environment, educators and designers can work together to create classrooms that better support diverse learning needs.

CONCLUSIONS

This study developed a circuit training game model to improve the fundamental motor skills of fourth-grade elementary school students. Expert validation results showed a feasibility score of 91.67%, indicating that the model met the required validity and reliability standards. The model consists of four game stations designed to develop locomotor, non-locomotor, and manipulative movement skills.

The small-scale trial involving 14 students produced mean scores of 3.86 for locomotor skills, 3.50 for non-locomotor skills, and 3.43 for manipulative skills. In the large-scale trial involving 29 students, the mean scores increased to 3.90, 3.79, and 3.76, respectively, on a four-point assessment scale. These findings indicate that the circuit training game model is feasible and effective in supporting the development of students' fundamental motor skills and increasing participation in physical education learning. Therefore, the model can be used as an alternative learning approach in elementary school physical education and may be adapted for broader educational contexts..

CONFLICTS OF INTEREST STATEMENT

The author declares that there is no conflict of interest regarding the publication of this paper.

AUTHOR CONTRIBUTIONS

The first author was responsible for the research design, data collection, data analysis, and manuscript writing. The co-author provided academic supervision, conceptual guidance, and critical revisions to improve the quality of the manuscript.

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